

Chapter 4

NATURAL RESOURCES

The UEC Planning Area contains a variety of natural resources, ranging from coastal barrier islands, mangrove forests, beaches and estuaries to inland forested, shrub, herbaceous wetlands, and uplands. This chapter provides an overview of these resources, discusses the water supply needs of natural resources, and describes some of the resource protection activities that are underway within the planning area.

COASTAL RESOURCES

Description of Coastal Resources

Coastal resources within the UEC Planning Area include barrier islands, coastal wetlands, and estuarine systems. Hutchinson Island is a low barrier island located along the eastern shoreline of Martin and St. Lucie counties. The eastern edge of the island supports a coastal dune community, which includes salt- and drought-tolerant species. West of the dune community, cabbage palm, saw palmetto, oaks and sea grape are present. The western edge of the island supports mangrove wetlands.

A coastal ridge is present along the eastern edge of the mainland within the planning area. This ridge forms a one-to-three mile wide area dominated by sand pine, saw palmetto, scrub oaks, and other xeric plant species. The Savannas, a remnant coastal wetland system, is located west of the coastal ridge and is discussed in greater detail in the Inland Resources section of this chapter.

Estuarine systems in the planning area include the Indian River Lagoon (IRL), St. Lucie Estuary (SLE), and a small portion of the Loxahatchee River Estuary (this estuary is being addressed in the Lower East Coast Water Supply Plan). These estuaries provide important habitat for threatened and endangered species and support commercial and recreational fisheries.

The IRL extends about 155 miles through six coastal counties from Ponce De Leon Inlet in Volusia County southward to the Jupiter Inlet in Palm Beach County. Within the SFWMD boundaries, the IRL encompasses approximately 48 square miles and includes the IRL proper from Fort Pierce to Stuart, the St. Lucie Estuary, Hobe Sound, and Jupiter Sound. The IRL watershed within the planning area incorporates approximately 1,120 square miles (20 surface water management basins). Land uses within this watershed include high density urban, extensive citrus operations, and large stretches of improved pasture.

The SLE is located in the southern region of the IRL in Martin and St. Lucie counties. The SLE watershed encompasses about 781 square miles and is divided into five major basins and several small basins (see Surface Water Resources section). The western basins are predominantly agricultural with about 70 percent of land in citrus and improved pasture. The two eastern basins (North St. Lucie and Tidal) are more urban with about 45 percent of the land devoted to agricultural activities.

The SLE is divided into three sections: the North Fork, the South Fork, and the Middle Estuary (Plate 1). The North Fork is about 4 miles long with a surface area of 4.5 square miles. Depths range from 10 feet in the central portion to 20 feet at its juncture with the South Fork. The North Fork is designated as an aquatic preserve. The South Fork has about half the surface area of the North Fork, and is relatively shallow except for an eight-foot navigation channel. This channel is part of the Okeechobee Waterway which links Stuart with Fort Myers through Lake Okeechobee and the Caloosahatchee River. The Middle Estuary begins at the confluence of the North and South Forks and continues to Hell Gate Point near the IRL proper.

Water Needs of the Coastal Resources

Maintenance of appropriate freshwater inflows is essential for a healthy estuarine system. Preliminary findings indicate that the total mean monthly inflows to the SLE need to be between 350 cfs and 1,600 cfs. Currently, flows range from 150 cfs to more than 4,000 cfs. Excessive changes in freshwater inflows to the estuary result in imbalances beyond the tolerances of estuarine organisms. The retention of water within upland basins for water supply purposes can reduce inflows into the estuary and promote excessive salinities. Conversely, the inflow of large quantities of water into the estuary as a result of flood control activities can significantly reduce salinities and introduce storm water contaminants. In addition to the immediate impacts associated with dramatic changes in freshwater inflows, long-term cumulative changes in water quality constituents or water clarity may also adversely affect the estuarine community.

INLAND RESOURCES

Description of Inland Resources

Water Bodies

Water bodies within the UEC Planning Area include natural lakes, man-made surface water impoundments, rivers, and creeks. Natural lakes within the planning area include Lake Eden in the Savannas State Preserve, Mile Lake which is west of the North Fork of the St. Lucie River in southern Port St. Lucie, and Banner Lake

which is south of State Road 708 in Hobe Sound. These lakes provide habitat for aquatic plants and animals and other wildlife that rely on open water during some portion of their life. They are not considered important sources of water supply for agricultural and urban uses in the planning area.

Man-made water bodies are also prevalent in the planning area. The largest of these is the Florida Power and Light (FPL) reservoir (Figure 8) which covers approximately 6,600 acres in western Martin County. Many small borrow pits and surface water management lakes have been dug throughout the planning area for fill and to improve drainage in low-lying areas. These ponds are common in the newer residential and golf course communities.

Major rivers in the planning area include the Loxahatchee and St. Lucie Rivers (Plate 1). The Loxahatchee River and the North Fork of the St. Lucie River have been designated aquatic preserves by the State of Florida. This designation is intended to preserve the biological, aesthetic, or scientific values of these resources for the enjoyment of future generations. Regulation of these resources should be reasonable and not interfere with traditional public uses, such as fishing, boating and swimming.

The Northwest Fork of the Loxahatchee River is the only river in Florida to be designated a Wild and Scenic River by the federal government. Although the Northwest Fork of the Loxahatchee River and its headwaters are within Martin County, the entire Loxahatchee River system is being addressed in the Lower East Coast Water Supply Plan.

Numerous creeks feed the St. Lucie River in both Martin and St. Lucie counties (Plate 1). These include Bessey, Danforth, and Mapps creeks, which are tributaries of the South Fork of the St. Lucie River downstream of the St. Lucie Canal; Five and Ten Mile Creeks which are tributaries of the North Fork of the St. Lucie River; and Willoughby and Manatee creeks, which enter the St. Lucie River near its junction with the Indian River Lagoon.

Wetlands

Wetlands are lands transitional between uplands and aquatic systems (water bodies) and are typically defined by vegetation, soils, and hydrology. Chapter 62-340, F.A.C., provides the statewide methodology for delineating wetlands in Florida and includes the following definition of wetlands: “those areas that are inundated or saturated by surface water or ground water at a frequency and a duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soils.” Wetlands within the planning area

include swamps, marshes, bayheads, cypress domes and strands, sloughs, wet prairies, riverine wetland hardwoods, and mangrove swamps.

Functions and Values of Wetlands. Wetlands perform a number of hydrologic and biological functions which make them valuable to man. Hydrologic functions performed by wetlands include receiving and storing surface water runoff. This is important in controlling flooding, erosion, and sedimentation. Surface water that enters a wetland is stored until the wetland overflow capacity is reached and water is slowly released downstream. As the water is slowed by wetland vegetation, sediments in the water (and chemicals bound to the sediments) drop out of the water column, improving water quality.

Wetlands also function hydrologically as ground water recharge-discharge areas. Wetlands may recharge the ground water when the water level of a wetland is higher than the water table. Conversely, ground water discharge to wetlands may occur when the water level of the wetland is lower than the water table of the surrounding land.

Biological wetland functions include providing habitat for fish and wildlife, including organisms classified as endangered, threatened, or species of special concern. Some species depend on wetlands for their entire existence, while other semi-aquatic and terrestrial organisms use wetlands during some part of their life cycle. Their dependence on wetlands may be for over-wintering, residence, feeding and reproduction, nursery areas, den sites, or corridors for movement. Wetlands are also an important link in the aquatic food web. They are important sites for microorganisms, invertebrates and forage fish which are consumed by predators such as amphibians, reptiles, wading birds and mammals.

Types of Wetlands. Inland wetlands within the planning area can be grouped into three major categories: forested, scrub shrub, and herbaceous wetlands. These classes were generalized from the National Wetlands Inventory (NWI), a branch of the U.S. Fish and Wildlife Service. The NWI is a nationwide wetland mapping system which was completed for the state of Florida in 1984. The NWI data was updated for the planning area by the District using 1990 and 1991 satellite images and aerial photographs. This update was not a detailed re-evaluation of the UEC Planning Area wetlands, but a generalized overview of the changes that have occurred in the region since the original NWI map was created. Plate 3 shows the updated wetland systems map of the planning area.

The three wetland categories are briefly described below:

Forested Wetlands. Freshwater forested wetland communities within the planning area include cypress, cabbage palm, mixed hardwood and bayheads.

Scrub Shrub Wetlands. The scrub shrub communities of the planning area can be found in a number of different habitat and hydroperiod ranges. Shrubs such as wax myrtle and St. Johns Wort, which are indicative of temporarily flooded soil, often border the wetter herbaceous marshes and prairie ponds. In the wetter areas, willow and small bay are the dominant shrub species.

Herbaceous Wetlands. Most of the herbaceous (emergent) wetlands in the planning area can be referred to as marsh. There are also sloughs, wet prairies and prairie ponds.

Distribution of Wetlands. Wetlands are present throughout the planning area as shown on Plate 3. Although numerous man-made impacts have altered the landscape, significant wetland systems remain in the planning area.

Martin County. The area now known as the Allapattah Flats (Figure 5) was historically a series of sloughs that flowed from St. Lucie County southwest into Martin County through Barley Barber Swamp and into Lake Okeechobee. This drainage pattern has been modified by highways, railroads, and drainage projects (Florida Power and Light, 1988). Currently, a series of isolated creeks, ponds, hammocks, sloughs and wet prairies exist within the footprint of the original Allapattah Slough (Martin County Growth Management Department, 1990).

Another large wetland system, Cane Slough (Figure 5), is located immediately west of Interstate 95. This slough flows from the northwest to southeast and is a recharge area for the headwaters of the St. Lucie River. A channelized connection exists between Cane Slough and the St. Lucie Canal. As a result of channelization and dikes, Cane Slough now consists of isolated cypress areas, ponds, and wet prairies.

The DuPuis Reserve and Pal-Mar Tract (Plate 2) also contain significant wetland systems. The 21,875 acre DuPuis Reserve is located in southwestern Martin County and northwestern Palm Beach County. This site contains numerous ponds, wet prairies, cypress domes, and remnant Everglades marsh. Save Our Rivers (SOR) funds were used to purchase the property. Management efforts are being directed toward improving wildlife habitat by restoring the hydrology of marshes and wet prairies and implementing prescribed burning and melaleuca control programs.

The 37,314 acre Pal-Mar Tract is located in Martin and Palm Beach counties. This tract is in the process of being acquired through the SOR program, Conservation And Recreation Lands (CARL) program, and Martin and Palm Beach County acquisition programs. As of September 1997, 4,422 acres had been purchased through the SOR program. Pal-Mar wetlands are primarily wet prairie ponds interspersed within a pine flatwood community. Despite some ditching, these wetlands are

generally in good condition. The proposed Pal-Mar SOR acquisition boundary includes a wildlife corridor which would connect Jonathan Dickinson State Park, Pal-Mar, Corbett Wildlife Management Area (in Palm Beach County), and the DuPuis Reserve.

Jonathan Dickinson State Park consists of 10,000 acres in southeast Martin County. It contains a variety of native uplands and wetlands, including pine flatwoods, sand pine scrub, palmetto prairies, cypress sloughs and domes, marsh, and wet prairies.

St. Lucie County. Emergent shrub and forested wetlands once covered much of St. Lucie County. However, many of these wetlands have been extensively drained to support agricultural and urban development. The few large remaining inland wetland systems include the Savannas; wetlands associated with Five Mile, Ten Mile, Cow, Cypress, and Van Swearingen creeks; remnant portions of St. Johns Marsh; and the floodplain of the North Fork of the St. Lucie River (Figure 3).

The Savannas is a freshwater wetland system located west of the Atlantic Coastal Ridge. It is one of the most endangered natural systems in the planning area. Historically, the Savannas formed a continuous system which stretched the length of the county. It was later interrupted by the drainage and development of Fort Pierce. Much of the system south of Fort Pierce has been purchased by the State of Florida under the CARL program (Plate 2). A 930 acre tract of the historic savannas community (North Savannas) is located north of Fort Pierce and has been acquired through the county SOR programs.

Okeechobee County Area. Large portions of Okeechobee County are comprised of wetland communities. The portion of the county located within the planning area includes large tracts of forested and emergent wetlands. These wetlands dominate the landscape creating a northwest to southeast system which continues into St. Lucie County.

Uplands

Upland plant communities in the UEC Planning Area include pine flatwoods, scrubby flatwoods, sand pine scrub, xeric oak, and hardwood hammocks. Uplands serve as recharge areas, absorbing rainfall into soils where it is used by plants or stored underground within the aquifer. Ground water storage in upland areas reduces runoff during extreme rainfall events, while plant cover reduces erosion and absorbs nutrients and other pollutants that might be generated during a storm. Upland communities, particularly, pine flatwoods and sand pine scrub, are seriously threatened by development in the planning area.

Pine flatwoods are the dominant upland habitat within the planning area. These plant associations are characterized by low, flat topography and poorly drained, acidic, sandy soils. Under natural conditions, fire maintains flatwoods as a stable plant association. However, when the natural frequency of fire is altered by drainage improvements and construction of roads and other fire barriers, flatwoods can succeed to other community types. The nature of this succession depends on soil characteristics, hydrology, available seed sources or other local conditions (Myers and Ewel, 1990).

Xeric sand pine scrub communities, although not as diverse as pine flatwood communities, contain more endangered and threatened plants and animals than any other South Florida habitat. Most of the sand pine scrub in the planning area is associated with the one to three mile wide ancient dune that lies along the eastern edge of the coastal ridge in Martin and St. Lucie Counties.

Water Needs of Inland Resources

Wetland Water Needs

Maintaining appropriate wetland hydrology (water levels and hydroperiod) is the single most critical factor in maintaining a viable wetland ecosystem (Duever, 1988; Mitch and Gosselink, 1986; Erwin, 1991). Rainfall, along with associated ground water and surface water inflows, is the primary source of water for the majority of wetlands in the planning area. The natural variation in annual rainfall makes it difficult to determine what the “typical” water level or hydroperiod should be for a specific wetland system. Because wetlands exist along a continuous gradient, changes in the hydrologic regime may result in a change in the position of plant and animal communities along the gradient. The effects of hydrologic change are both complex and subtle. They are influenced by, and reflect regional processes and impacts as well as local ones (Gosselink *et al.*, 1994). Hydrology, as well as other factors which influence wetland systems, such as fire, geology and soils, and climate, is further discussed in Appendix G.

James Gosselink states in a 1994 study on wetland protection from aquifer drawdown that a critical issue to be considered in the water supply planning process is how wellfield induced ground water drawdowns affect wetlands. An adverse environmental impact can be defined as: (1) a change in surface or shallow ground water hydrology that leads to a measurable change in the location of the boundary of a wetland; or (2) a measurable change in one or more structural components of a wetland as compared to control or reference wetlands, or to the impacted wetland before the change occurred (Gosselink *et al.*, 1994). Lowered ground water tables in areas adjacent to wetland communities have been shown to decrease wetland surface water depths and shorten the hydroperiod (length of inundation).

Aquifer drawdown and its subsequent effect on wetlands are best measured using three parameters; severity (the depth of the drawdown), duration (the length of time), and frequency (how often that drawdown occurs). The most obvious impact of reducing hydroperiods is a decrease in the size of the wetland. This is especially true of shallow, low gradient wetlands, which may be entirely eliminated by lowered water levels. Decreased wetland size reduces the available wildlife habitat and the area of vegetation capable of nutrient assimilation. Lowered water levels and reduced hydroperiod also: (a) induce a shift in community structure towards species characteristic of drier conditions; (b) reduce rates of primary and secondary aquatic production; (c) increase the destructiveness of fire; (d) cause the subsidence of organic soils; and (e) allow for exotic plant invasion (Gosselink *et al.*, 1994).

Upland Water Needs

The water supply needs of upland plant communities are not well known. It is assumed that the upper 6 to 10 feet of the Surficial aquifer is utilized by upland vegetation. Seasonal variations and local withdrawals from ground water play an important role in determining the type of upland vegetation that will develop.

Wildlife Water Needs

Appropriate hydrology is not just an issue for the plant communities, but also for the associated wildlife, including endangered and threatened species, and species of special concern (a list of endangered, threatened, and species of special concern found in the UEC Planning Area is provided in Appendix F). In South Florida, species composition, distribution and abundance are influenced by the annual pattern of rainfall, water level fluctuations, and fire. Alterations in water depth and/or hydroperiod that result in changes to vegetative composition and diversity may lead to the degradation of fish and wildlife habitat. In some portions of the planning area, reduced ground water levels have contributed to the invasion of wetlands by exotic species such as melaleuca. These pest plants quickly spread to disturbed areas where they crowd out native plants. This invasion reduces the number and diversity of wildlife that depend on native vegetation for food and shelter.

PROTECTION OF NATURAL RESOURCES

The District protects and enhances natural resources through its wetland policies and rules, wellfield location criteria, wetland buffers, wellfield monitoring, wetland mitigation banking, surface water planning, and land acquisition programs.

Wetland Policies

The District prevents significant adverse impacts to wetlands from ground water withdrawals by incorporating numerous state laws (Appendix A) into its consumptive use permitting process, which limit drawdowns beneath wetlands. The obligation to leave enough water in natural areas to maintain their functions and protect fish and wildlife is central to water supply planning.

The State Comprehensive Plan (Chapter 187, F.S.) states as a goal that Florida “shall maintain the functions of natural systems and the overall present level of surface and ground water quality.” The same document lists as a policy: “Reserve from use that water necessary to support essential non-withdrawal demands, including navigation, recreation, and the protection of fish and wildlife.” The Water Resources Act of 1972 (Chapter 373, F.S.) states: “The minimum water level shall be the level of ground water in an aquifer and the level of surface water at which further withdrawals would be significantly harmful to the water resources of the area.” The District’s Water Supply Policy Document affirms that “the District recognizes the state policies which establish priority protection of the water supply required to maintain and enhance healthy natural systems.”

The extent to which wetland preservation conflicts with water supply development depends greatly on the approach of that development. For example, options that increase water storage relieve the conflict between wetlands and human development, as does appropriate location and design of wellfields or the use of surface water. The challenge is to accept wetland protection as a constraint and then come up with the most reliable and cost-effective water supply strategy. The water needs of wetlands must be met; the plan’s approach at this time is to meet the intent of specific flows and levels for isolated inland wetlands, and to protect them against changes in existing water regimes.

Wellfield Location

Locating wellfields away from wetlands is an approach that can reduce local environmental effects but is not always easy to implement. Often the choice is reduced to either locating the wellfield in undeveloped areas with environmentally sensitive wetlands or in developed uplands where the potential for wellfield contamination is a serious concern.

Wetland Buffers

Another approach involves using man-made lakes or reservoirs as a buffer between wellfields and natural wetland systems. The water in these lakes act as a buffer by managing the local water table at a sufficient level to avoid impacts to

nearby wetlands. The surface water that is available in these reservoirs can also be used to supplement groundwater withdrawals.

Wellfield Impact Monitoring

The District's Resource Assessment division began a research program in 1995 to support development of wetland drawdown criteria. The research project is broken down into three phases.

Phase I consisted of: (1) a literature review to determine if sufficient information is present to support existing drawdown criteria or to recommend new criteria; (2) groundwater modeling; and (3) a scientific wetland expert workshop. This phase was completed November 1995.

The objectives of Phase II were to: (1) determine the extent and severity of impacts, if any, caused by ground water withdrawals under present and past drawdown criteria; and (2) identify wetland sites throughout the District for well installation and hydrobiological monitoring. The scheduled completion date for Phase II is December 1996.

Phase III has two main objectives: (1) implement long-term hydrobiological monitoring at wetlands located along a gradient of drawdown in selected study sites; and (2) test hypotheses regarding: (a) the effects of groundwater drawdowns on wet season biological productivity; (b) the dependence of surface soil moisture on the dry season water table position; (c) differences in ecosystem structure and function between wetlands subject to different amounts of drawdown; (d) the effects of local versus regional calibration of groundwater models used in the permit application process; and (e) symptoms of impact observed during drought.

Site characterization and well drilling contracts are presently underway. Monthly photographic monitoring began April 1996, while hydrologic monitoring began in the fall of 1996. There are two monitoring sites within the planning area; one at Jonathan Dickinson State Park, and the other at Sea Branch State Preserve.

Monitoring wetlands adjacent to wellfields ensures that withdrawal impacts are detected. Steps can then be taken to limit further impacts. Long-term monitoring of wetlands adjacent to wells provides documentation of impacts to wetlands that occur over time.

The hydrologic and biologic consequences of ground water withdrawal from wellfields in the Northern Tampa Bay region have been documented by the Southwest Florida Water Management District (SWFWMD). After long-term monitoring of wells and wetland systems, SWFWMD concluded that adverse impacts

are especially evident in areas where ground water modeling of withdrawals indicates a drawdown of one foot or more.

The type of impacts noted for marsh and cypress wetlands were:

- Extensive invasion of weedy upland species
- Destructive fires
- Abnormally high treefall
- Excessive soil subsidence/fissuring
- Disappearance of wetland wildlife

The SWFWMD ground water modeling has also shown that it may take one to two decades for the full effect of wellfield pumpage to be realized. Therefore, actual water levels in newer wellfields, or in wellfields currently not pumping at their maximum permitted levels, could become lower in the future. For these and other reasons, SWFWMD suggests that continued environmental monitoring will be necessary to ensure that Florida's wetlands are adequately protected (Rochow, 1994).

Wetland Mitigation Banking

Wetland mitigation banking is a relatively new natural resource management concept which provides for the advanced compensation of unavoidable wetland losses due to development. The Florida Environmental Reorganization Act of 1993 directed the water management districts and FDEP to participate in and encourage the establishment of public and private regional mitigation areas and mitigation banks. The act further directed the WMDs and FDEP to adopt rules by 1994, which led to the state's mitigation banking rule (Chapter 62-342, F.A.C.), becoming effective January 1994. In 1996, House Bill 2241 further developed this program by providing for the acceptance of monetary donation as mitigation in District and FDEP endorsed offsite regional mitigation areas. The bill clarified service area requirement credit criteria and release schedules, assurances and provisions that apply equally to public and private banks. As a result, the District and FDEP will adopt rules to implement these provisions. Wetland mitigation banking does not apply to water use related impacts.

Surface Water Improvement and Management

Two Surface Water Improvement and Management (SWIM) Plans have been adopted which incorporate portions of the UEC Planning Area: the Indian River Lagoon (IRL) SWIM Plan and the Lake Okeechobee SWIM Plan. The overall goal of both plans is to protect and restore surface water bodies.

Indian River Lagoon SWIM Plan

The Indian River Lagoon (IRL) was designated in 1987 as a state priority water body for protection and restoration under the Surface Water Improvement and Management (SWIM) Act. Under provisions of the Act, the two water management districts (SJRWMD and SFWMD) which encompass the IRL were required to develop and implement a SWIM plan to preserve protect and restore the water body. The IRL SWIM plan was completed in 1989 and updated in 1994. The goals of the plan are to:

- 1) Attain and maintain water and sediment of sufficient quality to support a healthy macrophyte-based lagoon system which supports species of fisheries and wildlife including endangered and threatened species.
- 2) Achieve heightened public awareness and coordinated interagency management of the IRL ecosystem.

The 1994 plan update identifies the St. Lucie Estuary (SLE) as the major problem area within the SFWMD portion of the lagoon. The plan identifies excessive freshwater runoff as a problem within the SLE and proposes reduction in these inflows through the development of specific pollutant load reduction goals (PLRGs). These are biologically based numeric targets for specific pollutants, with concurrent reduction strategies to achieve the target levels. Through the SWIM planning process, timelines for establishing PLRGs were established as required in Section 62-40.432, F.A.C.

As part of the effort to develop PLRGs, the SFWMD is quantifying appropriate freshwater inflows (both maximum and minimum) necessary to restore a productive ecological balance within the SLE. As previously stated, preliminary findings indicate that the total mean monthly inflows need to be between 350 cfs and 1,600 cfs. Currently, flows range from 150 cfs to more than 4,000 cfs. The relative target inflows for each specific SLE basin must now be determined so that appropriate management strategies can be developed for each basin.

Better management of SLE freshwater inflows will require modification of water management practices within the upland basins. Some of the potential options being considered in the SWIM program and Indian River Lagoon Restoration Feasibility Study include both regional and local retention facilities, better on-site management through the utilization of Best Management Practices (BMPs), operational changes within the C&SF canal system, and modified regulatory criteria for discharges to the IRL.

Lake Okeechobee SWIM Plan

The Lake Okeechobee SWIM Plan was enacted in 1989 and had its second update in August 1997. The environmental element recognized that adverse impacts to the St. Lucie Estuary occur when regulatory releases are made through the St. Lucie Canal (C-44) for lake flood protection purposes. Large, unnatural freshwater releases from the lake through the C-44 to the St. Lucie Estuary alter the estuarine salinity gradient and transport significant quantities of sediment to the estuary. Biota within the St. Lucie Estuary, Indian River Lagoon and near-shore reefs can be negatively affected by these high volume discharges.

The U.S. Army Corps of Engineers (USACE) in cooperation with the SFWMD, is currently evaluating environmental and economic impacts associated with proposed regulation schedules for Lake Okeechobee. The regulation schedule dictates the water levels within the lake, and regulatory discharge strategies to maintain these levels. This study will be completed in 1999.

Indian River Lagoon Restoration Feasibility Study

The SFWMD, in cooperation with the USACE, is conducting the Indian River Lagoon Restoration Feasibility Study (Feasibility Study) to address freshwater discharges to the SLE and IRL. The Feasibility Study, which is scheduled to be completed in July 2000, includes three phases. The first phase, problem identification/plan formulation, was completed in July 1997. The second phase, alternative plans evaluation, is scheduled for completion in April 1999. The Feasibility Study concludes with the completion of the third phase, engineering design and report preparation, in July 2000.

The following alternative plans will be evaluated in the Feasibility Study to address environmental restoration of areas adversely impacted by the C&SF Project system, flood damage protection, and urban and agricultural water supply:

- **Regional Attenuation Facilities (RAFs).** RAFS are expected to serve a number of objectives, including improved water supply for environmental base flow to the estuary, improved water supply for urban and agricultural uses, increased short hydroperiod wetlands, reduced sediment loading the estuary, and improved flood control in the region. Alternative RAF sites will be studied to determine those sites that reduce costs, ensure existing wetlands are not impacted, or provide for additional water uses.
- **Upper East Coast Flowway (C-131).** The flowway concept involves construction of a 10,500 acre water quality treatment facility located at the western juncture of Martin and St. Lucie counties, and a feature that would allow

excess treated water to be backpumped into Lake Okeechobee through the proposed C-131 canal.

- **On-site Detention/Retention.** This concept is similar to the RAF alternative except that the detention/retention facilities are constructed on developed land as opposed to having large regional facilities. On a site by site basis, similar benefits to those provided by regional detention facilities may be realized.
- **St. Lucie Flowway.** The flowway would capture some excess runoff in the C-44 basin that is now diverted to tide and divert the flow to the Loxahatchee Wildlife Refuge (Water Conservation Area 1).
- **Removal of St. Lucie Organic Sediments.** This alternative involves further investigation of a potential muck removal demonstration project that was completed by the SFWMD in January 1994. The report concluded that large-scale sediment removal may improve water quality by reducing re-suspension of fine sediments during periods of physical disturbance, and would reduce oxygen demands in the water column. The report recommended that further studies be undertaken prior to proceeding with the demonstration project.
- **Water Supply Alternatives.** Alternatives developed for the Feasibility Study will identify urban and agricultural water supply demands and will include water supply features related to the C&SF Project to help meet identified region needs, including the needs of the environment and the potential conflicts that may arise that this may create with other water users.
- **Future “Without Project” Condition (No Action Plan).** This alternative assumes that the Feasibility Study will at least include the Lake Okeechobee Regulation Schedule, and several SWIM projects including the St. Lucie Five Mile Creek retrofit, St. Lucie Virginia Avenue Structure Replacement, Indian River Community College Structure and Treatment Area, East Hanson Grant Treatment Area, and other St. Lucie and Martin county storm water retrofits identified by the SWIM Plan.

The evaluation process outlined in the Feasibility Study will include qualitative analysis and public workshops to screen the most viable alternatives for detailed study. This process will ensure that the alternatives are consistent with local interests and perspectives with respect to wetlands and wildlife conservation, economic development, comprehensive land planning, maintenance of water supplies, and agriculture.

National Estuary Program

The Indian River Lagoon (IRL) has been designated an estuary of national significance and is a component of the U.S. Environmental Protection Agency sponsored National Estuary Program (NEP). The IRLNEP program was initiated in 1991 and was given five years to develop a Comprehensive Conservation Management Plan for the IRL. The plan was finalized May 1996. The Comprehensive Conservation and Management Plan incorporates the IRL SWIM goals listed above, with the addition of a goal of identifying and developing long-term funding sources to implement the plan.

Land Acquisition Programs

Natural resources in the UEC Planning Area which have been, or are proposed to be, acquired for conservation/preservation purposes are shown on Plate 2. Some of the ongoing acquisition programs in the planning area are discussed below.

Save Our Rivers (SOR)

Florida's Save Our Rivers Program was started in 1981. The purpose of the SOR program is to obtain fee simple or other interests in lands necessary for water management, water supply, and the conservation and protection of water resources. SOR acquisitions and proposed acquisitions within the UEC Planning Area are shown on Plate 2.

Conservation and Recreation Lands (CARL)

The CARL program was established by the Florida Legislature in 1979. The primary purpose of this land acquisition program is conservation and protection of environmentally unique, irreplaceable ecological resources. CARL acquisitions within the UEC Planning Area are shown on Plate 2.

County Land Preservation Programs

In 1989, Martin County passed a \$20 million bond referendum to purchase conservation (environmentally sensitive) and recreation (active parks) lands. In 1996, the Martin County Board of County Commissioners passed a resolution establishing the Martin County Preservation/CARL Acquisition Task Force. This committee recommended to the commissioners ways to leverage money in order to ensure that the three CARL/SOR properties in Martin County are acquired prior to the sunset of P2000. Those properties are the Atlantic Ridge (14,200 acres), Pal-MAR (23,700 acres in Martin County) and Allapattah (32,800 acres). The Commissioners are considering another \$27 million bond referendum in the fall of 1998.

St. Lucie County voters passed a \$20 million bond in November of 1994. Since then, this money has been used to match the District's SOR funds, thereby allowing the completion of land purchases in the Indrio North Savannas project and the North Fork St. Lucie corridor. It will also be used to help fund future public lands purchases including mangrove parcels in the Indian River Lagoon Blueway," the Cypress Creek/Trail Ridge Property, and Round Hammock.

County land acquisitions are shown on Plate 2. In addition to acquisition of environmentally sensitive areas, Martin County has a strict wetland protection policy. The 1990 Martin County Comprehensive Growth Management Plan protects all wetlands, regardless of size or biological condition. Their destruction (and subsequent mitigation) is not permitted.